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## Food Production

# Methods of Fighting Hunger

by Professor Alexei Pokrovsky, Moscow \*

**M**eeting man's need for food has always been acknowledged to be one of the most important and most complicated problems set as a task before the human race. Today, it is necessary to approach this problem from the social, economic, agricultural, technological, and medical aspects. The high rate of population growth, notably in developing countries, makes of it the most urgent topical problem. The 22nd and 23rd General Assemblies of the UNO have dealt with it with particular thoroughness.

The social aspect, with the aim of changing the society structure, is the most important of the above-mentioned. But the scientific and technological questions to improve the food supply situation of the entire population are also of no less importance. This scientific and technological side of the problem is to be analysed in this article.

### **The Food Situation of the World's Population**

At the present time, food supplies of any given country can be studied only in close context with the food supply situation of the entire population of the world. Recent years' statistical returns for the whole world both on the rates of population growth and on the production yields of crucial foodstuffs do not leave the slightest doubt about the fact of food scarcity, especially in developing countries. Probably, very many distinct causes could be made responsible for this state of affairs, e.g. the low level of farming yields which is the special responsibility of the colonisers and also the beginning urbanisation and the high

rates of population growth both of which are characteristic for these countries.

The favourite descriptive term of present usage is that of the population explosion. Every week the population of the world has been growing, for some time, by about one million persons. Statisticians have worked out as our future fate a probable world population of five thousand million by 1985 and of over six thousand million by the year 2000. As more than half of to-day's humanity suffers from an undersupply with food-stuffs, especially with proteins, the situation appears to be obviously parlous. Only science can find a way out of this dilemma.

Through mutual cooperation of a number of international organisations (as for example FAO) and of other bodies, a working group composed of protein experts has been formed and attached to UNO, whose task it will be to help work out scientific base material for drawing up a programme for overcoming the world's protein crisis. In 1966, Professor Cuthbertson (of the UK), Dr Bhathia (India) and the author have drawn up a report which suggested a number of ways along which the present protein crisis could be overcome.

Ample documentation which is available to various UN bodies permits the painting of a highly detailed picture about the supply of protein foods available to the populations of different continents—and this is certainly not an agreeable picture. The picture provides a rough breakdown of the human race into two distinct categories—the first population group being that of the industrialised countries, e.g. of the US, USSR, Europe, Japan, etc., the food supplies of which

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are, by and large, sufficient for their needs. The second group consists of the populations of many developing countries in Africa, Latin America, most of Asia, etc. Daily energy consumption, in the first group of countries, amounts per head of population to about 3,000 kilocalories, in the second to about 2,000 kilocalories, which is by one third less. Similarly, the first group of countries can supply their population, on the per head/per day basis, with about 90 grammes of proteins, whilst the second group has at its disposal only less than 60 grammes of proteins per head and per day. But the worst shortage exists in the supplies of high-grade animal proteins, which consist of dairy products, meat and fish. In industrialised countries, this per-head figure shows daily variations of between 40 and 50 grammes, whilst in the development countries, a daily intake per head of only ten grammes is rarely even reached.

### **The Part to be Played by Dietary Science**

Where can we find a way out of this cruel dilemma, and which part can be played in this context by dietary science?

Firstly, this discipline will provide a scientific basis for the most rational utilisation of existing food reserves in any given country;

Secondly, together with other disciplines, dietary science will open up completely new ways of building up food production from concrete conditions as given in every single country;

Thirdly, dietary science will be of invaluable help in spreading rational feeding habits among wide groups of the undernourished population.

However, the differences over the question how food supplies ought to be composed are so wide that this complex problem probably requires a thorough airing most urgently.

We will deal here only with those assertions that appear most paradoxical. There is, for example, a widespread opinion that Malthus was, after all, only right in asserting that the rate of population growth of the present day is incompatible with the possibilities of increasing food supplies, and that there is no way out of this dilemma. Some sociologists, basing their advice on this belief, seek salvation from impending famine only through a sudden reduction in the world's population figure. Others are preaching the so-called law of decreasing crop yields, and they talk of agriculture as of an obsolete form of production with out-of-date methods that make it unprofitable and thus doomed to perdition. Their only way out is along chemical synthetic operations on an industrial basis of compounding tons and tons of elemental nitrogen, oxygen from the atmosphere, crude oil, natural gas, coal, etc. A third group believes that it can show us the way

to redemption through building up a microbiological fermentation industry and through producing several types of foodstuffs from fossil fuels through having them transformed by microbe action into the primitive proteins of monocellular animal or plant life.

### **The Standpoint of the Soviets**

Being of the opinion that present-day pessimism in judging the possibilities of improving food supplies is without ground for the immediate future, Russian dietary science rejects all such extreme views. That it is possible to improve supplies is being guaranteed, on the one hand, by the growing potentialities of modern science and by the important food reserves available on the surface of our planet, provided we know how to utilise them and to avoid unnecessary losses in their production and distribution, and on the other hand, by the eminently practical possibility to improve the distribution of foodstuffs. For it is not only the difficulty of producing food, even more so, it is the inefficiency inherent in the distribution system which complicates the solution of existing difficulties.

In this context, it must be recalled that the Soviet Union has ample experience in overcoming rather difficult food supply situations. Twice in the comparatively brief life of the Soviet system, it was faced with acute famine and sharp food shortages. The first famine period was the time of civil war after the October revolution of 1917, the second one fell in the period of the Second World War and the years immediately after it. Foodstuffs were then distributed according to expert medical advice, based on the daily food intake requirements of different classes of working and non-working people. The best possible supplies which the State could provide were given to its children. And it would probably be much more useful for many developing countries to follow these same precepts and experiences during periods of difficult food supplies.

As to the increase of food supplies for the world as a whole, it would be useful and desirable to produce, above all, economic and scientific reasons for the proposals that are being brought forward for overcoming the prevailing protein shortages. The first measures of this kind would certainly have to be a supreme effort for intensifying farming methods to increase the availability of traditional high-value foodstuffs (especially dairy products, meat and fish) on the basis of improving national husbandry and farming of every individual country.

### **Limited Value of Synthetic Foodstuffs**

Unfortunately, arguing out such methods for improving food supplies frequently leads to differences of opinion. Experts underline the enormous

expenditure of work in farming, as opposed to the low economic output, especially of animal husbandry. It is stated (and with good reason) that, in transforming vegetable proteins into animal proteins, much of the food value of the fodder is lost. It is then said that the human race and its science have achieved a state of scientific development which enables them to think of synthesising its food through making synthetic proteins, fats, and carbohydrates, so as to gradually do away with farm produce. However, such notions are full of errors. Even though it may one day be possible and practicable to synthesise foodstuffs, this method will never be able to claim dominance in this field. Sowing, planting, and animal husbandry will for a very long time remain the principal sources from which the human race has to draw its food supplies. Moreover, it must not be forgotten that farming is an excellent method of absorbing and accumulating a relatively high proportion of the sun's radiant energy poured out daily over the surface of the earth, whereas synthetic food production from crude oil, natural gas, and coal is also based on a merely delayed use of accumulated radiant solar energy that has been stored up in the past through the process of photosynthesis.

It is, of course, to be welcomed if chemists endeavour to improve our food supply situation but, nevertheless, this effort ought to be judged with extreme caution. As a medical man and public health expert with certain experiences in the field of feeding a big population, I am all for the utilisation of the rising usefulness of food chemistry, especially in the field of auxiliary chemicals being made available for farming.

#### **How to Overcome Protein Shortages**

An important and highly promising possibility for improving food production is fishing and fish breeding. Fish proteins are not of inferior food

value compared with meat, and in certain cases, e.g. for old people, they are even better than meat. The Soviet Union has done much in utilising the food capacities of the high seas, and we gladly put at the disposal of developing countries our experiences in this respect. However, it becomes more and more evident every day that, apart from expanding fishing on the high seas, it becomes imperative to plan for the reproduction of fish populations. In other words, the human race is being called upon to use similar precautions in the breeding and raising of fish as they have been using for thousands of years for the breeding and raising of cattle and poultry. As mankind is able nowadays to increase the efficiency and yields of animal husbandry, and to raise the volume of cattle populations, this ought also to be possible in the maintenance and increase of fish population in the seas.

Cattle and poultry breeders are now dealing with various races which show only a vague similarity with their genetic ancestors. Successful selection and the deliberate use of genetic knowledge have enabled man to breed new and efficient races in a relatively short time. It therefore seems a highly topical task of the present day to breed deliberately more efficient providers of protein among fishes and other marine animals, perhaps through setting up deep sea fish farms for utilising the food supplies of the oceans more rationally than hitherto.

It is of at least as great importance to avoid losses of foodstuffs that have already been produced, e.g. losses which occur when they are stored. In developing countries, such losses are often enormous. In India, for example, according to the reports of Indian experts, between twenty and thirty per cent of the grain harvest are eaten up by rodents. Almost one third of all grain harvested is destroyed in a country where hunger is endemic among a large part of the popula-



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tion,—what that means, one can easily imagine! This additional third of grain supplies could be made available if it was only possible to use modern extermination methods against rodents and other destructive parasites on the Indian farms.

It is also necessary to preserve the food values which have a high potential, biologically. It is well known that certain proteins contained in food grains are insufficiently ingested by the human body—only between fifty and sixty per cent are utilised as food; the balance is rejected by the body. The reasons for such incomplete assimilation is the absence of some essential amino acids. It is therefore highly advisable to produce foodstuffs which are more readily assimilable and thus provide, biologically, higher food value. There are two different methods conceivable: it might be possible to add the amino acids that are lacking to the foodstuff in question. But this does not always produce the desired effect. Another method might be to form food compounds from a number of naturally grown foodstuffs, so that they supplement each other and yield a complex and balanced food. The USSR has used this way in order to develop pearl barley and bread types of enhanced biological food value, and the food processing industry in the Soviet Union now produces them commercially. Development countries and, for that matter, all countries where food scarcity is looming would be well advised to use such methods. In this context, the research carried out by the Soviet Academician, A. Nesmeianov, is of particular interest.

For feeding the population, it ought to be made customary to a much higher degree than now to utilise the proteins contained in the seeds of oil plants, e.g. soybeans, cottonseed, and sunflower kernels which, after their oil content has been extracted, are mostly used as protein live stock fodder. US scientists have done considerable research in this field, and they have succeeded in producing soybean protein for human food use, in the form of thin filaments, which they spin into a sort of yarn. The yarn is then woven into structures reminiscent of meat, fish, and other familiar food products.

### **How to Increase Food Reserves**

We have now reached a point in our discussion where we ought to cast a glance on the possibilities of building up a microbiological food industry, which means the utilisation of monocellular proteins for making human food from them. Experience has shown that most people's digestion does not accept readily the proteins produced by yeast cultures, certain primitive algae, or other microbes. It is certainly conceivable

that they will become useful, in a broader form, as foodstuffs one future day. But it is probably much more advisable to view this form of potential protein supplies as one of many contributions to the general "protein fund"—which consists of animal and plant proteins and of protein substances obtained from industrial fermentation and synthesis.

We are of the opinion that the notion of an overall protein fund will be acceptable both in respect of the entire world and of individual nations. But how is the overall protein fund being utilised and distributed? It goes in the first instance to supporting human food requirements, in the second instance to maintaining fodder requirements for cattle and poultry and, in the future, also to feeding fish broods, and finally, to sustaining technical processes. Statistical returns of the industrialised countries show that more than half of all protein produced is utilised for live stock feeding but only a minute proportion for fish breeding in ponds and other waters, as well as for industrial purposes. For this reason, it would appear most useful to utilise protein concentrates from the fermentation processes of microbes mainly for live stock feeding and for the breeding of fish. This would enable farmers to release more proteins than hitherto from the use for fodder purposes, e.g. milk, fish, oil seeds, etc., which could be then used for feeding humans. This appears to be the most important conclusion to be derived from our conception, which appears to be applicable to the problems of every individual country.

As can be seen, modern science has enormous capacity for increasing food reserves. It is necessary to judge these possibilities soberly on a strictly scientific basis, and to demand that new technologies in food processing must not set up any health risks and must add to the biological value of the foods processed. The main aim of all farming and industrial activities that have anything to do with the production of food must be the protection of the health of the populations fed and the lengthening of their life expectation.

It is clear that developing countries will have to solve these problems under the concrete conditions of their economic development. What they need are improvements of their methods of farming, the training of highly skilled experts, etc. In this respect, the Soviet Union grants them extensive practical help. It is of course unnecessary to discuss the blessings which might have been brought to humanity if the colossal sums which are being spent today for military programmes, and sometimes even on direct warfare, had not been wasted in this way but used for solving the food problems of the world, for banning hunger and famine from the surface of this planet.